Asian sugarcane smut - *Sporisorium sacchari*

Sporisorium sacchari is one of several Asian species parasitizing only the flowers of species of *Saccharum*, thus causing much less damage to the plants than does the more widespread sugarcane smut that infects buds and reduces growth of shoots. Although windborne, and probably contaminating seeds, *S. sacchari* spreads less well with the vegetatively propagated cane plants. Nevertheless, its effects on other possible hosts could pose a threat to native or agricultural plants if it were introduced.

Sporisorium sacchari (Rabenh.) Vánky 1985

Sori (spore-containing bodies) in swollen ovaries, ovoid to short cylindrical, 3-5 mm long, partly hidden by parts of floret; spore masses covered by a pale brown membrane (peridium) rupturing irregularly, usually at apex, exposing blackish-brown, semi-agglutinated to powdery masses surrounding a short, tapering columella of plant and fungus tissue.

Spores initially aggregated in very loose spore balls, 25-30 µm diam, separating later, globose, subglobose, or ovoid to slightly irregular, 7-10 x 7-11(-12) µm, yellowish-brown; wall ca. 0.8 µm thick, finely and densely echinulate (spiny), spore profile appearing smooth or near smooth.

Spore germination produces 4-celled basidium bearing fusiform basidiospores.

The fungus replaces the ovary and seed in the individual florets with small bodies containing the compacted to powdery, dark spore balls. Dissemination of the spores leaves the erect pale tapering columella in the center of the floret.

See Mundkur, 1942; Vanky, 2007.

Host range: Species of *Saccharum* (Poaceae)

Geographic distribution: Widespread in Asia from India to Japan

NOTES

Vanky (1985, 1987) transferred this species to the genus *Sporisorium* because of its grass host, agreeing with Langdon and Fullerton (1978) that the genus *Sphacelotheca* is restricted to smuts on dicotyledonous plants in the Polygonaceae. Later molecular taxonomic work on the smuts showed that *Sphacelotheca* belongs in the order Microbotryales and that this order is more closely related to the rusts (Urediniomycetes) than the smuts (Ustilaginomycetes) (Vanky, 2006). *Sporisorium* is closely related to Ustilago, the type genus of the Ustilaginaceae (Piepenbring et al., 2002; Stoll et al., 2003). Among these 'true' smuts, morphological characters of the sorus, previously used in taxonomy, are not phylogenetically informative, appearing to be influenced by the host (Stoll et al., 2005), such that additional close examination is required to distinguish genera and species.

The name *Sphacelotheca sacchari* L. Ling & T.L. Chen is a later homonym of the combination made by Ciferri earlier the same year (Vanky, 2007). Ling and Chen did not designate a type, and the type for Rabenhorst's *Ustilago sacchari* was destroyed by fire, so that the comparison cannot be made, but Vanky (2000, 2007) agrees with Ling (1953) that the Chinese species is probably a synonym.

SIMILARITIES TO OTHER SPECIES/CONDITIONS

Other smut fungi occurring on *Saccharum* spp.:

Sporisorium erianthi (Syd. & P Syd.) Vanky (a *Sphacelotheca erianthi* (Syd. & P. Syd.) Mundk. 1942) differs in having smaller spores, 5-9(-10) µm diam, and larger sterile cells, 12-16 µm diam

Sporisorium macrosporum (J.M. Yen & C.S. Wang) L. Guo & Y.B. Li differs in having larger spores, 11-15 x 12-18 µm diam with larger spines.

Sporisorium pulverulentum (M.C. Cooke & G.E. Massey) Vanky differs in having larger spores, 8-9 (-12) x 9.5-13(-14) µm diam, with a serrulate profile.

Sporisorium scitamineum (Syd.) M. Piepenbr.,et al. 2002 (= *Ustilago scitaminea* Syd. 1924) infects buds and shoots and differs in having the sori produced not in the florets but on the inflorescence stem replacing the panicle with a long thin curved body containing small blackish-brown spores, 5.5-7.5 x 6.5(-10).µm). Spore walls vary in profile from smooth to echinulate.

Sporisorium kusanoi (Syd. & P. Syd) Vanky (= *Ustilago kusanoi* Syd. & P. Syd.) is reported only on *Saccharum bengalense*, affects the whole inflorescence in the manner of *S. scitamineum*, and has small,

smooth to finely punctate spores, 3-5.5 x 3.5-6.5 µm diam.

For additional information, see Vanky (1994, 2007).

DISTRIBUTION

This species is distributed in a wide range of the warmer parts of Asia, from Iran to the Philippines, but is recorded from only parts of India and China (EPPO, 2006). Ciferri (1938) identified it as introduced to Italy, but Vanky (1994) did not indicate that it had become established. One record (Piepenbring, 2002) apparently reports an accidental introduction into Colombia.

RISK OF INTRODUCTION

The risk of introduction is associated with possible transport of vegetative seed stock or of true seed for use in breeding/hybridization of cultivated species of *Saccharum*, but is diminished by the fact that the fungus does not infect the vegetative parts, but only the flowers. If introduced at planting, the fungus would have to survive in the field until flowering, and then succeed in infecting from the soil or stem.

DETECTION AND INSPECTION METHODS

Sporisorium sacchari occurs in the individual florets only and are visible as small grayish to dark brown bodies replacing the ovary and seed. Individual spores mixed with the seed or adhering to stems could only be detected and identified using high magnification light microscopy.

NOTES ON CROPS/OTHER PLANTS AFFECTED

Some hosts of this fungus may be identified as species in *Erianthus*, a synonym of *Saccharum* (Vanky, 2000). No hosts are clearly shared with *Sporisorium scitamineum* (Vanky, 2000, 2006) except that *Saccharum officinarum*, the cultivated sugarcane, has been reported as a host in China (Zundel, 1953; Tai, 1979) and the Philippines (Reinking, 1919).

MOVEMENT AND DISPERSAL

Natural dispersal: Natural dispersal of smut spores from infected plants is primarily driven by wind (Lee-Lovick, 1978).

Vector transmission: Not reported.

Accidental introduction: Accidental introduction could occur if spores are present on vegetative planting stock, true seed imported for breeding purposes, or on stems of *Saccharum* sp. that are marketed or used in construction.

IMPACTS

Economic impact: Holliday (1980) indicated that the smuts on sugarcane other than *S. scitamineum* are economically unimportant. Because the flowers are infected, rather than the buds, *S. sacchari* has much less effect on growth of the stems, which are the harvested plant parts.

Cultural control and sanitary measures: Methods for reducing or destroying inoculum of *S. scitamineum* (Lee-Lovick, 1978) could be applied for *S. sacchari* but may not be economically feasible.

HOST RESISTANCE

Because smut caused by *Sporisorium sacchari* is less economically important (Holliday, 1980), the use of resistant varieties, preferred for control of *S. scitamineum* (Lee-Lovick, 1978), would be even more preferable for the flower-infecting smut.

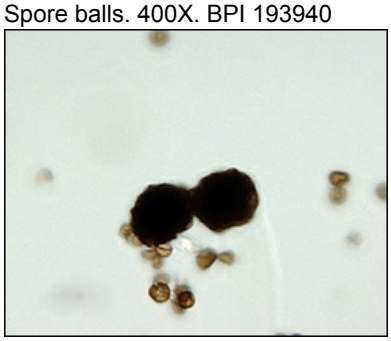
GAPS IN KNOWLEDGE/RESEARCH NEEDS

Additional information is needed on the biology of survival between crops and infection of flowers.

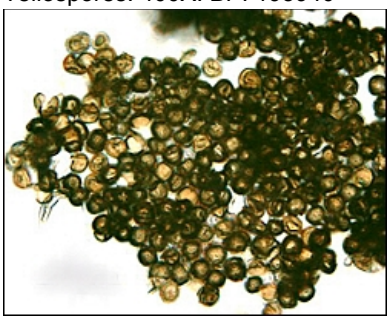
References

Smut bodies in florets. 20X BPI 193940

Spore balls. 400X. BPI 193940



Teliospores. 400X. BPI 193940



Teliospores. 1000X. BPI 193940